"Detection and Characterization of Nanomaterials in Complex Matrices”

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Nanoparticles are already used in several consumer products including food, food packaging and cosmetics and their detection and measurement represent a particularly difficult challenge [1].

The European Commission has published in October 2011 its recommendation on the definition of nanomaterial [2]. This definition calls for the measurement of the number based particle size distribution in the 1-100 nm size range of all the primary particles present in the sample independently of whether they are in a free, unbound state or as part of an aggregate/agglomerate. This definition does present great technical challenges for developing measuring methods [3]. One important aspect of measuring the number-based nanoparticle size distribution are the difficulties involved in converting the mass or intensity based measurements to number based measurements. When weighted distributions are considered, the basis of the distribution is particularly important and conversions between the different distributions are currently not very reliable.

In this presentation I will illustrate the development of techniques for the size measurement of nanoparticles when addressing this new definition of nanomaterials. These new methods are based on the combination of size separation techniques, such as flow field flow fractionation, with identification and quantification steps, such as ICP-MS.

The problems to be overcome in measuring nanoparticles in complex matrices (such as food, consumer products, and the environment) will be illustrated with data obtained in our laboratory [4-5].

References

[1] Calzolai L. et al., Review on Measuring Nanoparticles Size Distribution in Food and Consumer Products. Food Additives & Contaminants 2012, Part A 29: 1183-1193.
[2] Recommendation on the Definition of nanomaterials (2011/696/EU).
[3] T. Linsinger et al., Requirements on measurements for the implementation of the European Commission definition of the term 'nanomaterial'. JRC Reference Reports. EUR 25404 EN (2012).
[4] Cascio, Claudia, et al. "A critical experimental evaluation of key methods to detect size and quantify nanoparticulate silver." Analytical chemistry (2014).
[5] Cascio, Claudia, et al. "Comparative Detection, Sizing and Quantification of Silver Nanoparticles in Antimicrobial Consumer Products." Journal of Analytical Atomic Spectrometry (2015).